Ultraviolet Coatings, Materials and Processes for Advanced Telescope Optics

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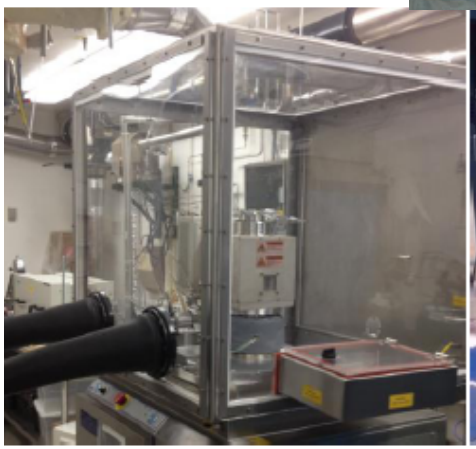
Description and Objectives:

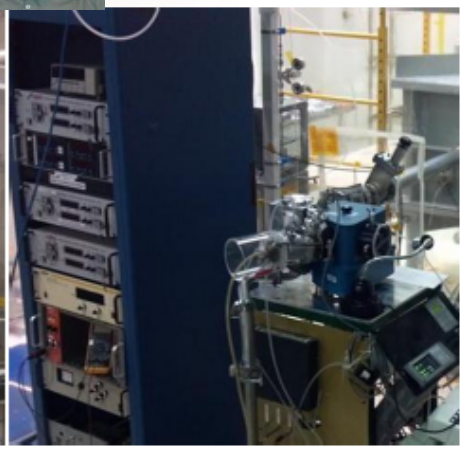
- "Development of UV coatings with high reflectivity (>90-95%), high uniformity (<1-0.1%), and wide bandpasses (~100 nm to 300-1000 nm)" is a major technical challenge as much as it is a key requirement for cosmic origins program and for exoplanet exploration program. This project aims to address this key challenge and develop feasible technical solutions.

Key Challenge/Innovation:

- Materials and process technology are the main challenges. Improvements in existing technology base and significant innovations in coating technology such as Atomic Layer Deposition will be developed.



ALD chamber at JPL



Deep UV Test station at U of Colorado

Approach:

- A set of experimental data will now be developed with MgF_2, AlF_3 and LiF protected Al mirrors in the wavelength range 100 to 1000 nm for a comprehensive base of measured data to enable full scale developments with chosen materials and processes.
- Enhanced coating processes including Atomic Layer Deposition (ALD) will be studied; Characterization and measurement techniques will be improved.

Key Collaborators:

- Stuart Shaklan (JPL), Nasrat Raouf (JPL), Shouleh Nikzad (JPL), Frank Greer (JPL), Paul Scowen (ASU), James Green (Univ of Colo)

Development Period:

- Jan 2013 – Dec 2015

Accomplishments and Next Milestones:

- A coating chamber has been upgraded with sources, temperature controllers and other monitors to produce coatings of various fluorides; measurement tools are also established now at JPL and U of Colo.
- Preliminary coatings with various fluorides will be produced and characterized during Aug-Dec 2013.
- Enhancements to conventional coating techniques will be developed; ALD coating process tools and process will be established at JPL (2014)
- ALD and other enhanced coating processes for protected and enhanced aluminum mirror coatings will be developed and improved (2015)
- Test mirror coupons representing a meter-class mirror to be produced and characterized (2015)

Application:

- The technology developed through this project will enable future astrophysics and exoplanet missions that aim to capture key spectral features from far UV to near infrared.

TRLin = 3 ***TRLcurrent = 3*** ***TRLtarget = 5***